Team Controller
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User Manual

Northrop Grumman

Weapon System Support Software

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1.0 - Table of Contents

2.0 - Introduction

The Weapon System Support Software is an application used to diagnose complex weapon systems. The features among this application include:

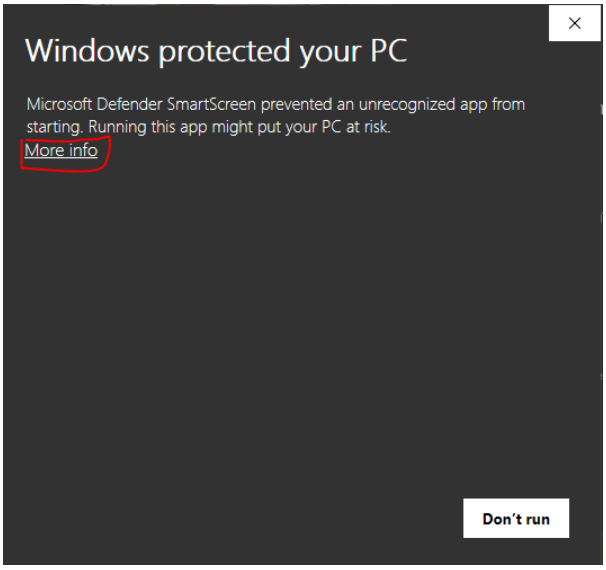
- Easy connection via serial communication;
- Outputting controller data to a log file;
- Overview of the event and error data;
- Easy viewing of the status updates of the weapon;
- Electrical display for any electrical component associated with the weapon.

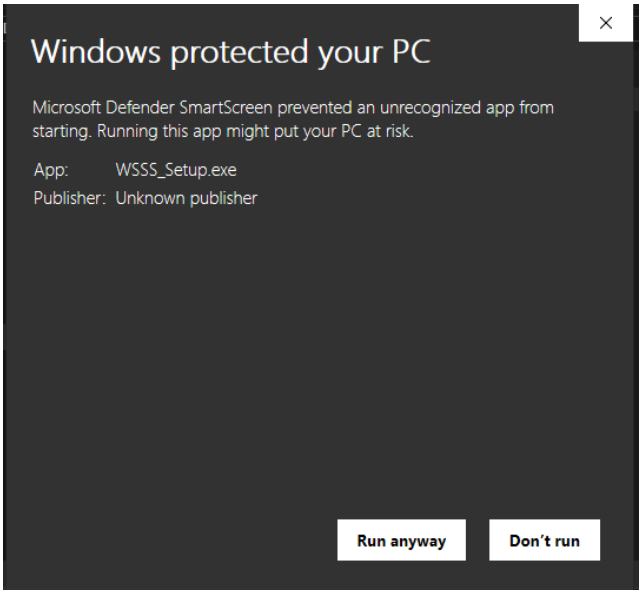
Team Controller wishes the best

3.0 - Installation

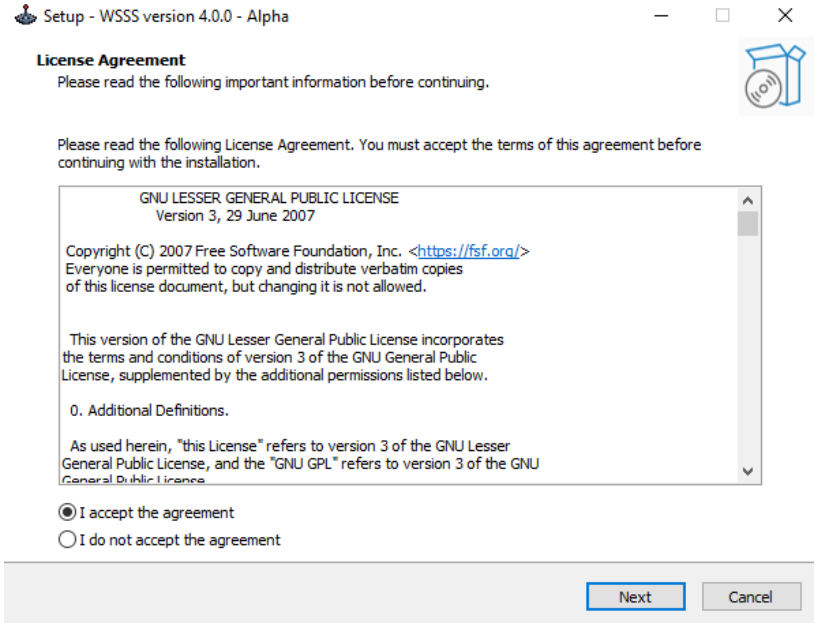
In this section, you will be able to download the installer and install the application onto your computer.

1. Download the installer from github: https://github.com/Team-Controller-NAU/Controller/blob/main/project-docs/WSSS_Setup.exe
    a. This installer is not signed as of writing, so this windows defender warning will occur. Press “More info” -> “Run anyway” to continue with the installation.

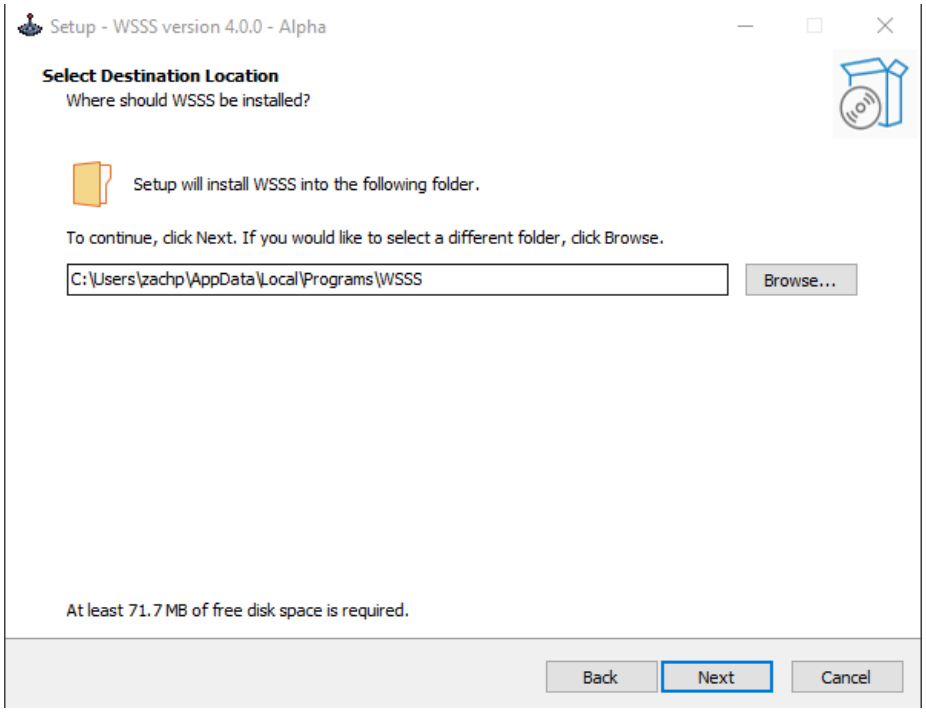




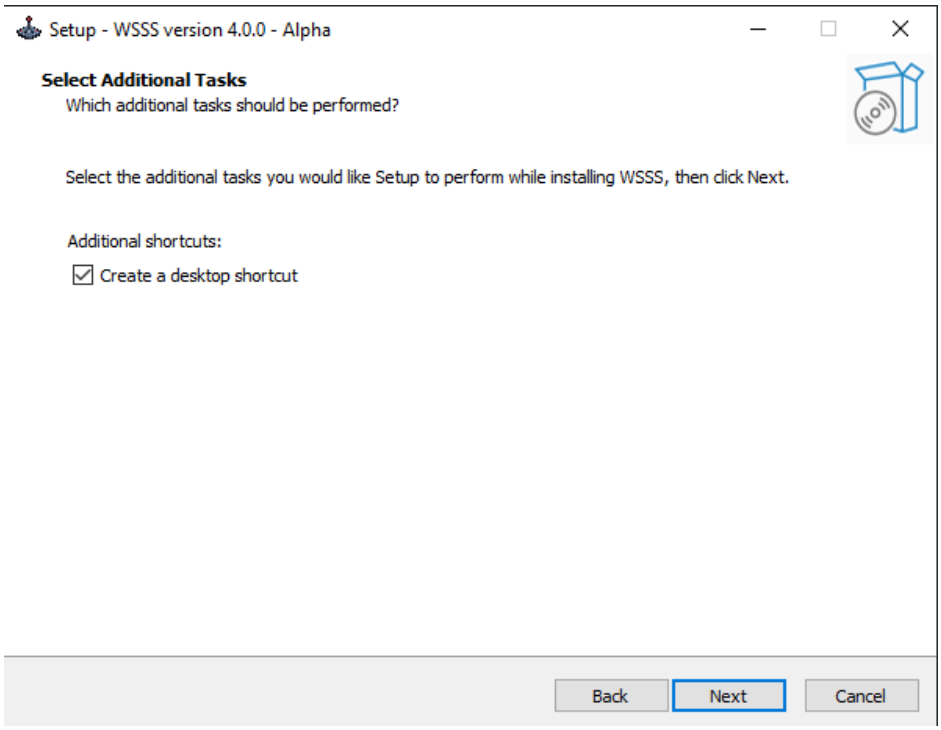
2. Once installed, open the installer. The installer will open to the screen below. This is to accept the end user agreement the QT Framework uses.



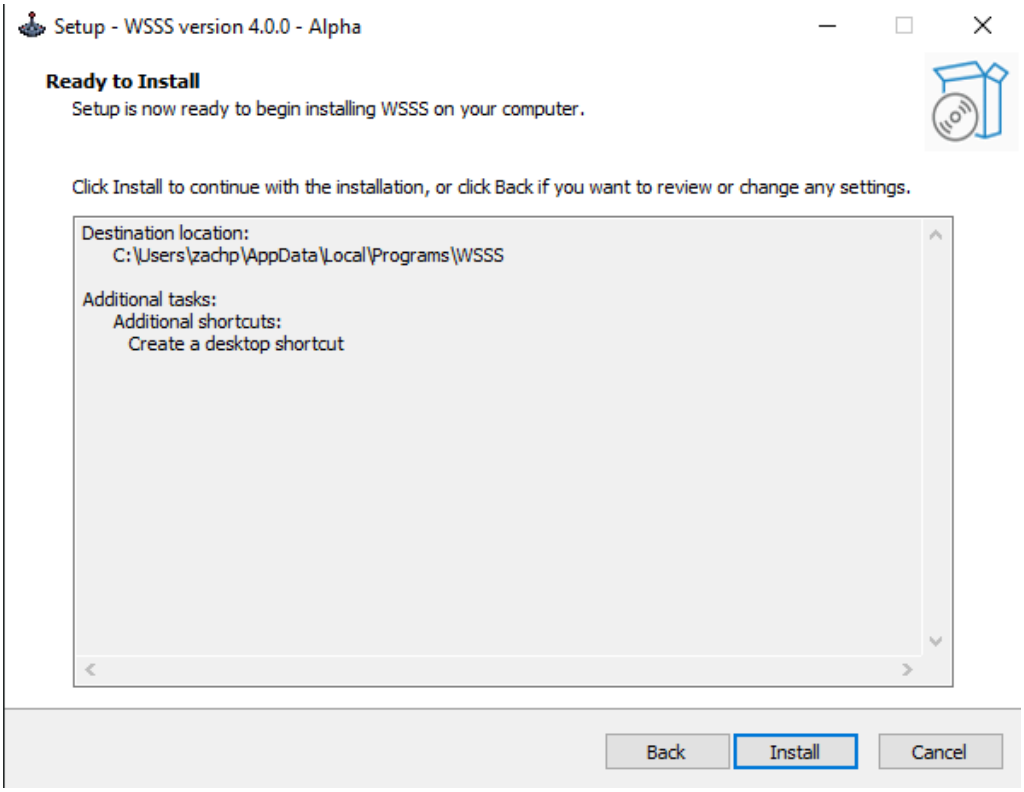
3. Once accepted, the installer will then show this screen. You can select where the application is installed.



4. This screen shows the option to create a desktop shortcut.



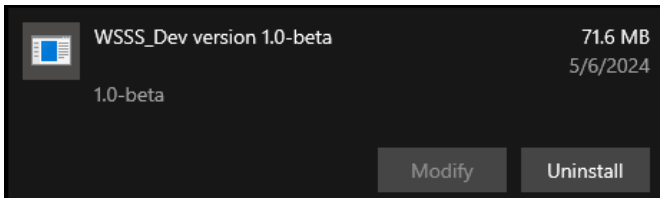
5. This final screen displays the installation confirmation. After clicking the install button, the application will download and install on to the user's computer.



Once the installation is complete the application will be installed on the user's computer.

3.1 - Uninstall and Reinstall

The easiest pathway to uninstall the application is to navigate to the **Apps & Features** section in the Windows Settings. There the user can uninstall the application through Windows.



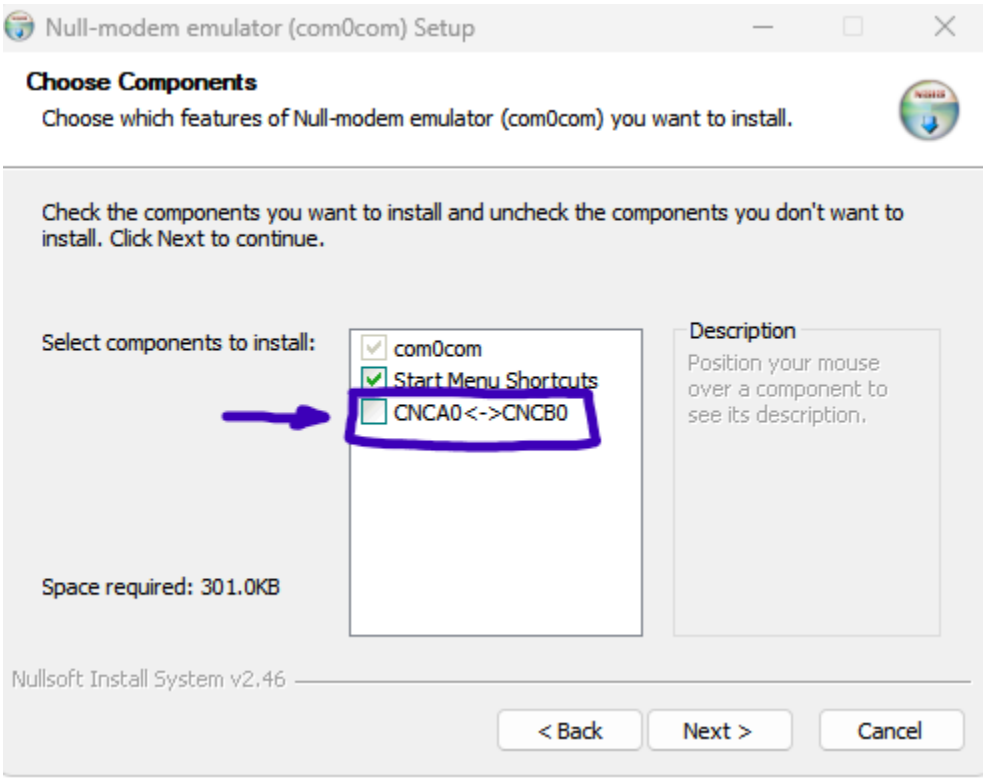
To reinstall the application, simply navigate back to the installer and repeat the process listed above.

4.0 - Configuration and Daily Operation

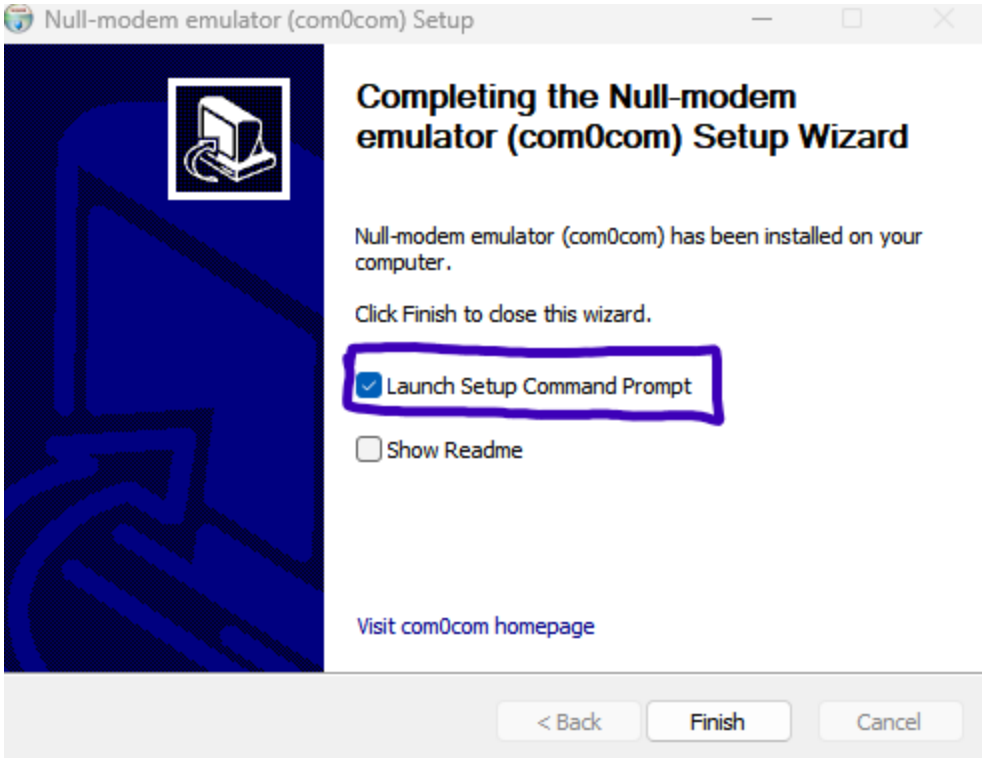
4.1 - [OPTIONAL] Installing Virtualized Serial Ports

For testing serial communication, we often used virtualized serial ports to facilitate communication between our controller simulator and our application without the need for serial hardware. To do this you must install 2 serial drivers and a serial bus to connect them. We used an application called com0com (the installer is automatically downloaded when visiting the link).

Once you launch the installer, we recommend you uncheck the box labeled **CNCA0<->CNCB0** It is meant to automatically set up the ports but we have experienced issues using this feature.



Continue with the setup until you get to the "**Finish"** page. Here you will check "**Launch Setup Command Prompt**" then finish. In the command prompt you can type "help" to get a list of commands to set up and customize your ports.



For example in the command prompt you can enter the following commands (with your desired port names… port names should begin with COM followed by a number) to create the virtualized ports and check if the process was successful.

install PortName=COM9 PortName=COM10

And then to list the current ports to confirm success, type:

list

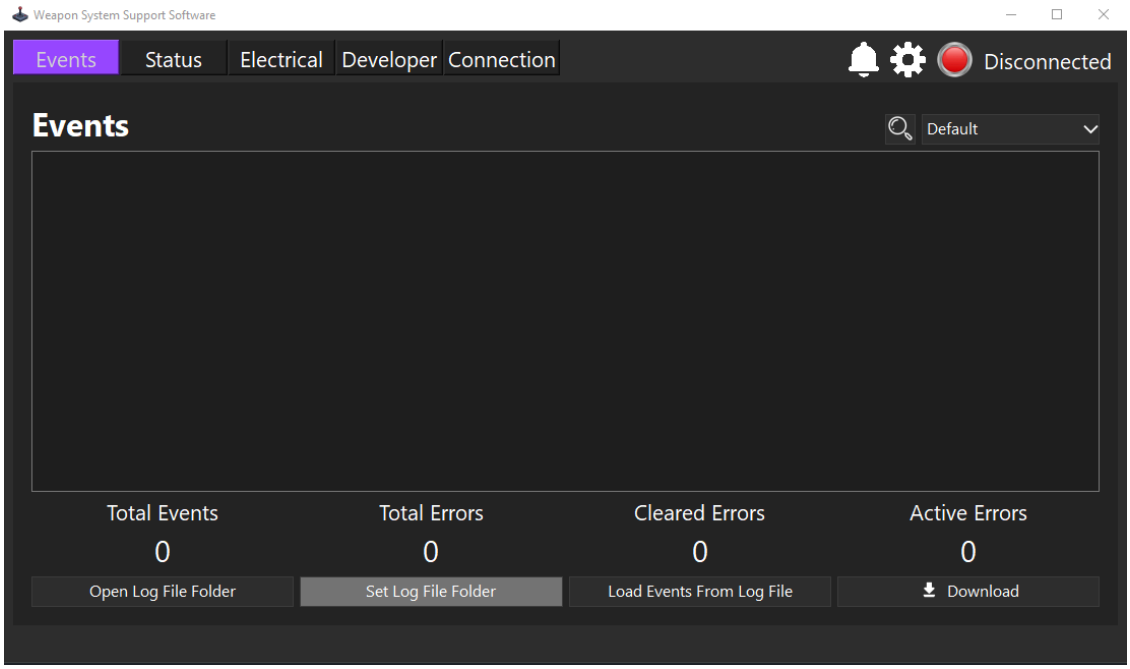
```
ommand> install PortName=COM9 PortName=COM10
       CNCA2 PortName=COM9
       CNCB2 PortName=COM10
omDB: COM9 - logged as "in use"
omDB: COM10 - logged as "in use"
ommand> list
       CNCA0 PortName=-
       CNCB0 PortName=-
       CNCA1 PortName=COM4
       CNCB1 PortName=COM5
       CNCA2 PortName=COM9
       CNCB2 PortName=COM10
```

After this process, your virtualized ports will be accessible by our application and you can close the command prompt. If you experience issues, you can visit online forums and/or the ReadMe documentation for troubleshooting help.

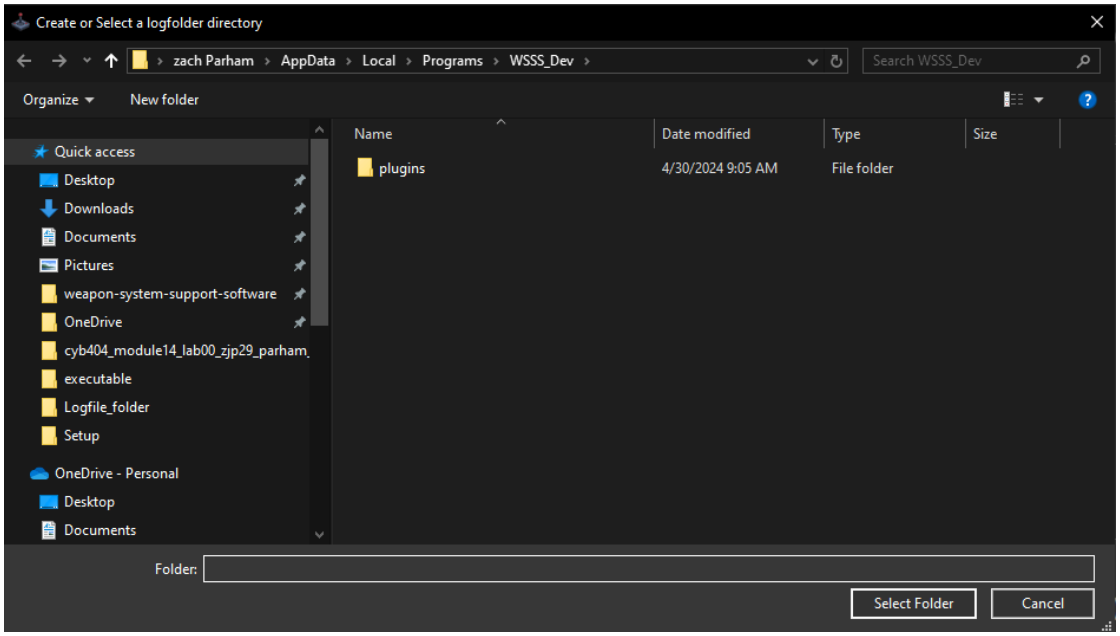
To use these serial ports in the application, select one of them on the **Developer page**, then click **start CSim**. Navigate to the **Connection page**, select the other port and click **connect.**

4.2 - Configuring Settings

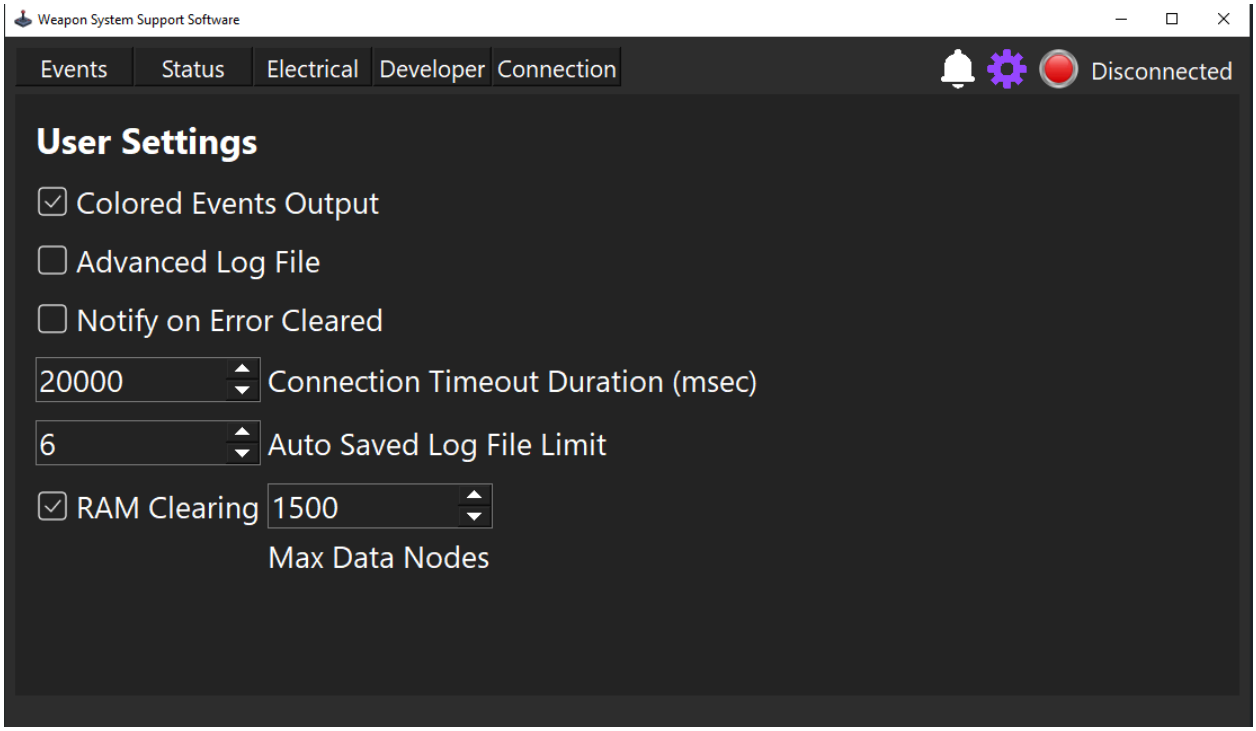
The very first thing a user should do after downloading the application is configure their settings. First, navigate to the Events page on the top right.



On this page you will find the button to set a log file folder path. This should be the first setting to enable, simply click on the “Set Log File Folder” button and this will take you to a folder prompt where you can select the location where log files are stored. This location is easily accessible by the “Open Log File Folder” button.

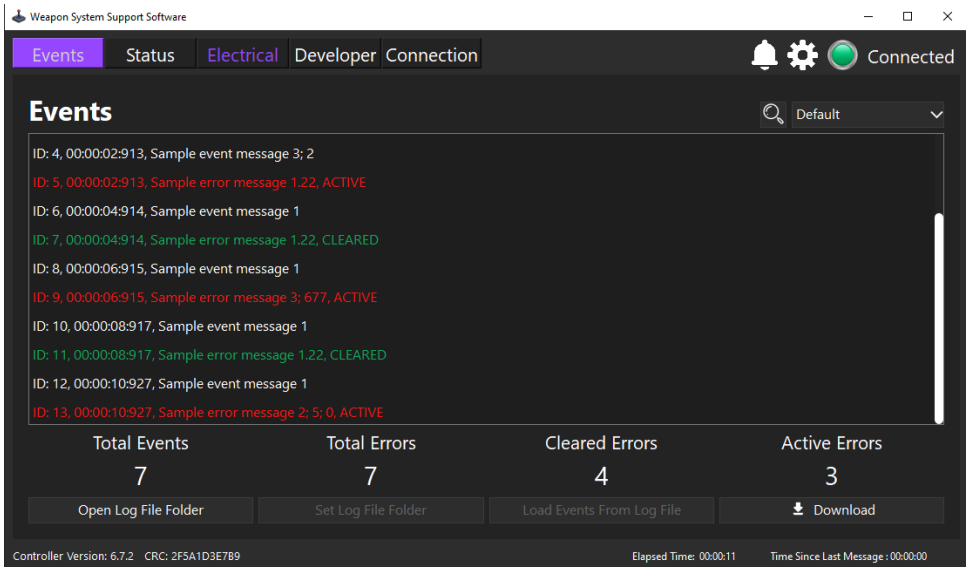


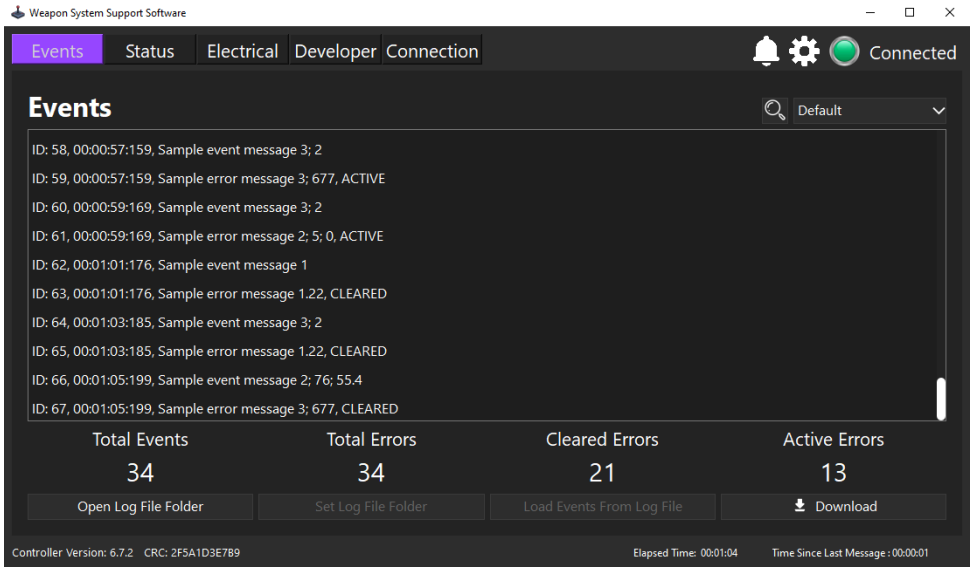
Next, more user focused settings can be located in the cog icon in the top right corner next to the connection status icon.



These options are additional quality of life improvements for the end user. The description of these settings are as follows:

- **Colored Events Output** - Affects the events page. When enabled the GUI will display color coded events and errors. When disabled, the events and errors will become white. Below are screenshots showcasing the colored and uncolored outputs.



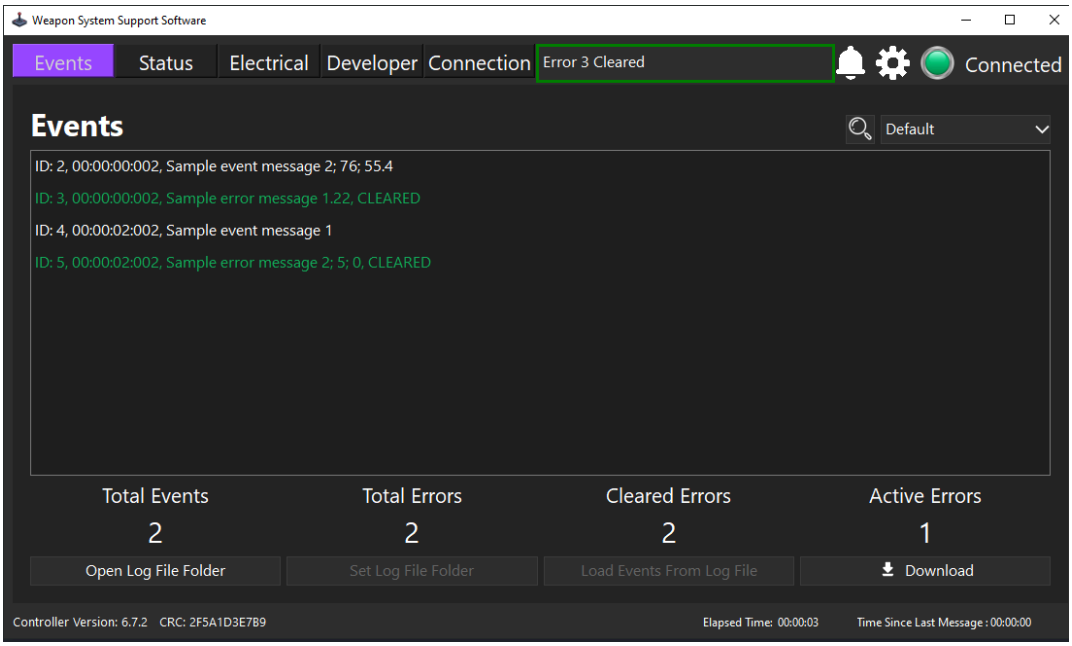


- **Advanced Log File** - Affects the log file output. When enabled, additional information will be added to the log file which includes the status updates. When the connection is ended with this setting enabled, the log file will also include electrical data as well as session statistics. However, when disabled this extra information is not included in the log file. Below are screenshots showcasing the status update data, electrical data, and session statistics in the log files.

```
***ADVANCED LOG FILE ENABLED
***Status Update: Armed: 0, Trigger 1: 1, Trigger 2: 0, Controller State: 2, Firing Mode: 30, Feed Position: 225, Total Firing
Events: 6, Burst Length: 17, Firing Rate: 1597.87,
ID: 138, 00:02:17:495, Sample event message 1
ID: 139, 00:02:17:495, Sample error message 3; 677, CLEARED
***Status Update: Armed: 1, Trigger 1: 0, Trigger 2: 0, Controller State: 3, Firing Mode: 55, Feed Position: 270, Total Firing
Events: 6, Burst Length: 33, Firing Rate: 18.8729,
ID: 140, 00:02:19:503, Sample event message 3; 2
ID: 141, 00:02:19:503, Sample error message 2; 5; 0, ACTIVE
***Status Update: Armed: 1, Trigger 1: 1, Trigger 2: 1, Controller State: 2, Firing Mode: 305, Feed Position: 315, Total Firing
Events: 6, Burst Length: 44, Firing Rate: 673.14,
ID: 142, 00:02:21:508, Sample event message 2; 76; 55.4
ID: 143, 00:02:21:508, Sample error message 3; 677, CLEARED
***Status Update: Armed: 1, Trigger 1: 1, Trigger 2: 0, Controller State: 0, Firing Mode: 330, Feed Position: 0, Total Firing
Events: 6, Burst Length: 15, Firing Rate: 198.667,
ID: 144, 00:02:23:520, Sample event message 2; 76; 55.4
ID: 145, 00:02:23:520, Sample error message 2; 5; 0, ACTIVE
***Status Update: Armed: 1, Trigger 1: 0, Trigger 2: 1, Controller State: 1, Firing Mode: 30, Feed Position: 45, Total Firing
Events: 6, Burst Length: 16, Firing Rate: 1780.17,
ID: 146, 00:02:25:535, Sample event message 1
ID: 147, 00:02:25:535, Sample error message 1.22, ACTIVE
***Status Update: Armed: 1, Trigger 1: 1, Trigger 2: 1, Controller State: 0, Firing Mode: 55, Feed Position: 90, Total Firing
Events: 6, Burst Length: 18, Firing Rate: 1119.75,
ID: 148, 00:02:27:549, Sample event message 3; 2
ID: 149, 00:02:27:549, Sample error message 3; 677, ACTIVE


***Status Update: Armed: 1, Trigger 1: 0, Trigger 2: 1, Controller State: 1, Firing Mode: 305, Feed Position: 315, Total Firing
Events: 7, Burst Length: 33, Firing Rate: 1238.17,
ID: 222, 00:03:41:899, Sample event message 2; 76; 55.4
ID: 223, 00:03:41:899, Sample error message 3; 677, CLEARED
***Electrical Data: Servo Motor, Voltage: 19.1, Amps: 2.34, Pump Cooler, Voltage: 2.6, Amps: 3.7, Internal Temp Sensor, Voltage:
33.9, Amps: 4.2, Alternator, Voltage: 96.5, Amps: 3.33
***Session Statistics: Duration: 00:03:41, Total Events: 112, Total Errors: 112, Non-cleared errors: 75, Total Firing events: 7
```

- **Notify on Error Cleared** - Affects the notification page. When enabled this setting will send a notification telling the user which error has been cleared. Below is a screenshot of a notification for error 3's clearing.

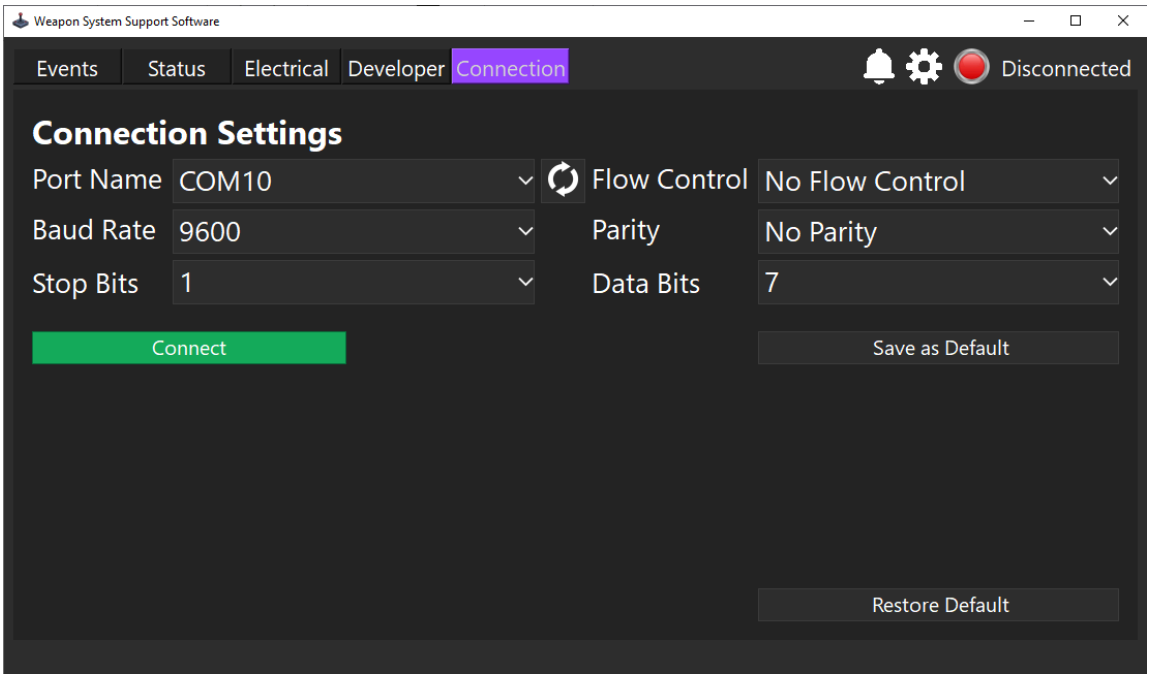


- **Connection Timeout Duration** - Affects wired connections. The time entered here will be the time it takes to end a session when there has been no communication between the controller and the application.
- **Auto Saved Log File Limit** - Affects the autosaved log files. This number is how many autosaved log files are retained before deleting the oldest file.

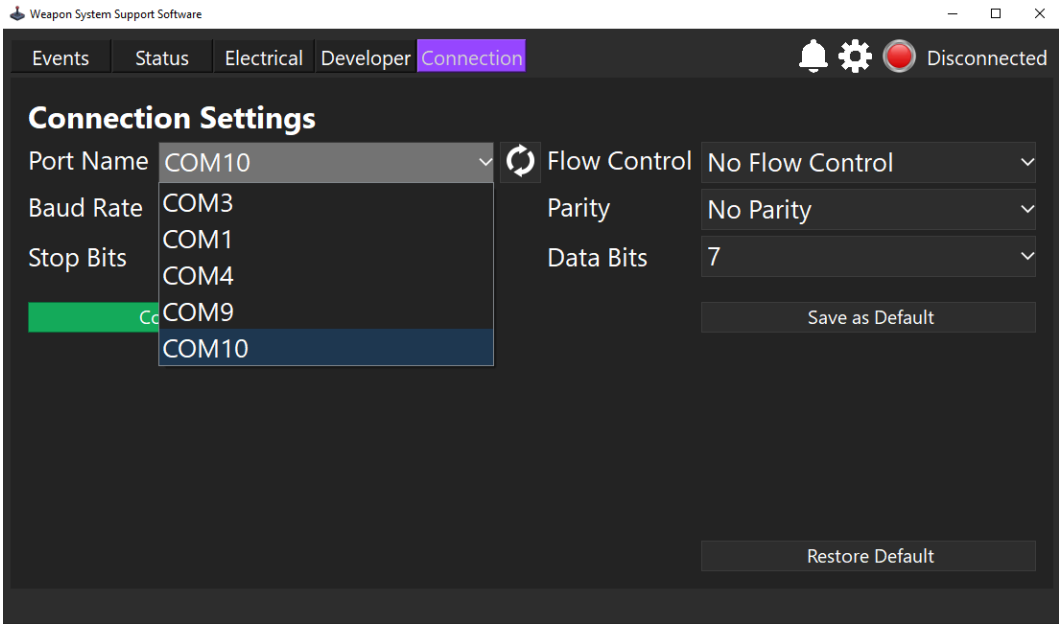
- **Ram Clearing** - Affects performance. When enabled, data values are removed from the GUI to save RAM and the actual data is saved in the log file. The value listed is the limit of how many events or errors are taken into the GUI before the application clears them.

4.3 - Connecting to a Serial Port

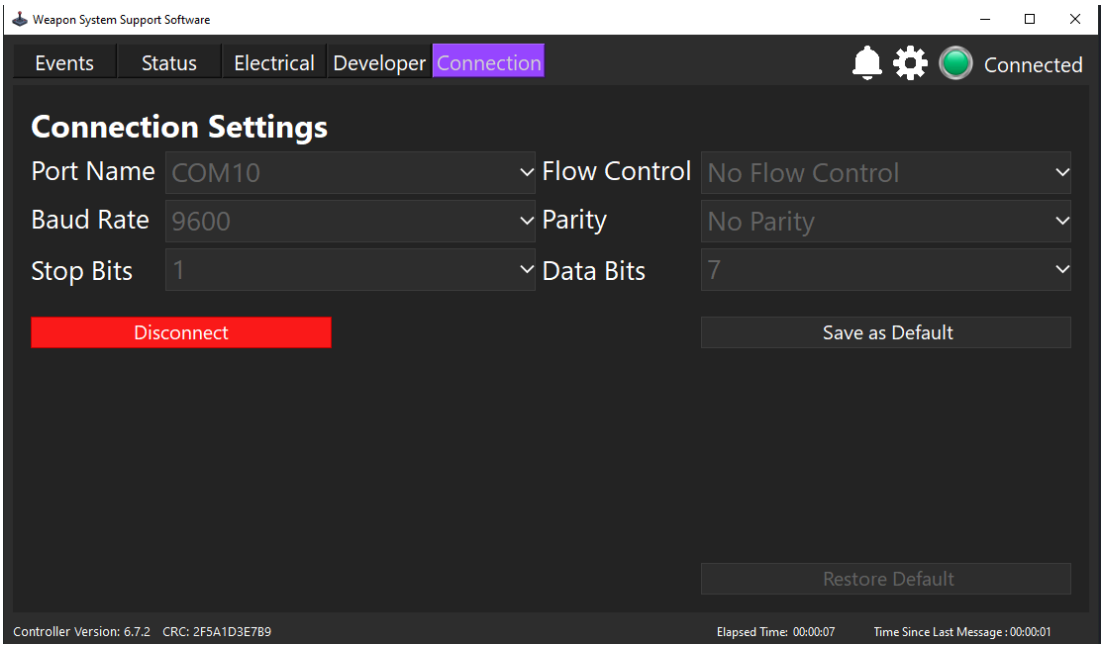
Upon launching, the application will be in a disconnected state. To connect to the controller, navigate to the connection tab on the very right side of the tab lists. Here the user will see standardized settings related to serial communication. The serial communication settings from the controller should match here.



The user would then modify the port the controller is currently connected to. On wired connections these ports would be the same. If the user is using virtualized ports, the Controller Simulator port and the Connection page port are different. Simply connect to the virtualized ports created in section **4.1**.



Once the settings are matched in the case of a wired connection to a physical controller, the user is able to connect to start receiving data. At this point, these connection settings are no longer modifiable to ensure there is not an error during the transmission process.



4.4 - Log Files

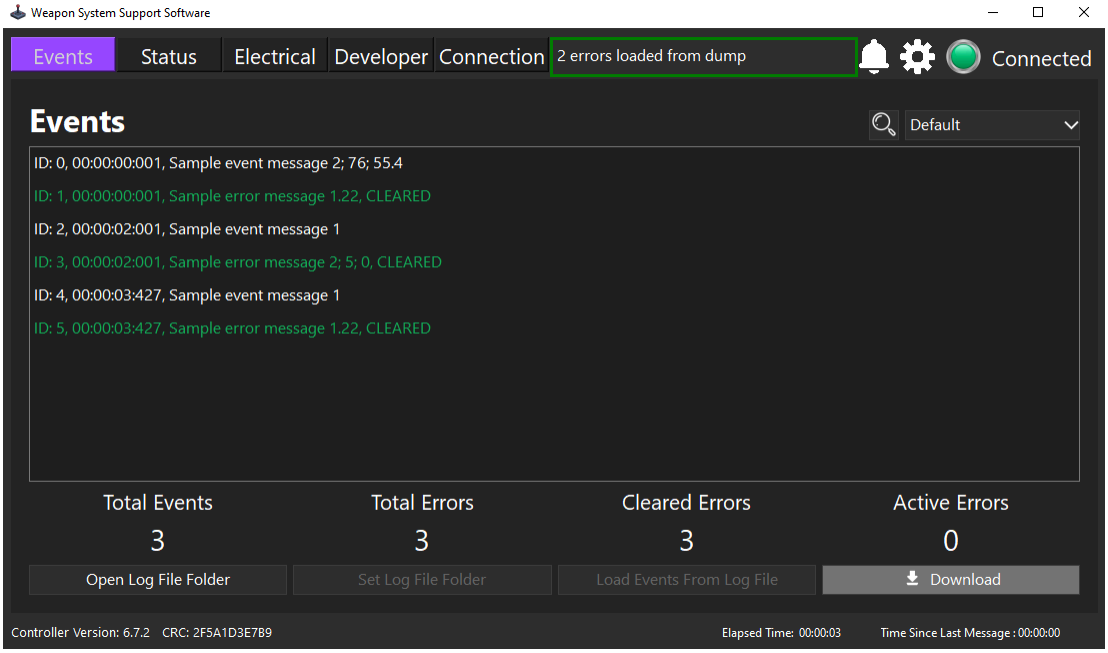
One of the biggest features of this application is the ability to save log files with the current set of data. The two paths log files can take are autosaved files or manual downloads.

4.4.1 - Autosaved Log Files

As mentioned above in section **4.2**, log files have a limit before they are deleted from the log file folder. This limit is customizable by the user. These log files are differentiated by the -A ending to their name. These types of files are meant to ensure data is not lost in the case that the connection is suddenly interrupted or the application crashes. The user does not have to manually download these, however they do need to save a copy of that log file if they need it.

4.4.1 - Manually-Saved Log Files

The manual log files are saved explicitly from the user by clicking the download button on the Events page. These files are differentiated Once this button is clicked, a log file is created that contains all the event and error data up until the button is clicked.



5.0 - Maintenance

We automatically handle the maintenance of the deployed application: the user just needs to set their preferred log file limit and the program will maintain that number of log files. If you save log files manually, you must manually delete those when you are done.

As for the source code, the complete repository is provided on github and contains extensive comments within the code as well as supporting documentation in the project docs directory. We have done our best to adhere to quality programming standards and promote modularity within our program to make the process of further development as easy as possible for our clients.

The clients will also be given the option to contact our team for further assistance if need be.

6.0 - Troubleshooting

6.1 - Failure To Launch Application

This error may occur if the installation has failed in some way, potentially via missing or corrupted application files. This may also occur if the user is running the application on an operating system that is not supported.

First, the user should make sure that they are installing the application on either a Windows or Linux (Ubuntu) operating system. Then, they may try to reinstall the application to make sure no files were corrupted or missing during the initial installation.

6.2 - Failure To Conduct Serial Communication

A user may experience trouble connecting to a serial port and receiving messages for a number of reasons:

- Incorrect serial port settings (port name, baud rate, etc)
    - Ensure that the serial port settings are properly configured in the connection tab of the application, especially with the correct port name. Verify that the baud rate/stop bits/flow control/parity/data bit settings all match that of the controller device.
- Weak/disconnected physical connection
    - Check the physical connection of the serial cable. Ensure it is securely connected to both the weapon controller and the maintenance laptop. Replace with a different cable if issues persist.
- In use port
    - Close any other applications or devices that may be using the selected serial port, causing interference or locking you out from opening the port.
- Outdated serial drivers
    - WINDOWS: Update your drivers through the Device Manager tool. Right click your port in the list of devices, and select “Update driver”. If there are no updates available, make sure your installation of Windows does not have any pending updates either.
    - Update your drivers through the manufacturer’s website of the device/motherboard on the system

6.3 - Application Freeze or Crash

One of the main causes of this problem is resource exhaustion. If there are thousands of messages being sent, especially at a very fast interval, this may cause the application to slow down as it tries to process these messages or retroactively clear errors. To work around this, the user should enable the “Ram Clearing” setting in the settings page by clicking the gear icon in the top right corner of the application. Usually, the application tends to slow down when processing a couple thousand nodes—so this setting should be set to at least 2000 or lower. Also close any unnecessary applications that may be running in the background to free up system resources. If a crash occurs during a session, any data that the application was able to process will still be saved and available in the latest autosave log file.

7.0 - Conclusion

This manual is to help anyone understand the application and to make it as simple as possible. Starting with how to install the application and then how to use all the application main features. For the maintenance we made it as easy as possible so it is mainly just the log files that need maintenance. Overall our team has enjoyed working on this project and we are very thankful for our clients for sponsoring this project. As the team is graduating soon and moving onto professional careers we are happy to answer any questions you may have. Our contact information can be found below:

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- Bradley Essegian: bbe24@nau.edu
- Brandon Udall: bcu8@nau.edu
- Dylan Motz: djm658@nau.edu

Best wishes from Team Controller!